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## **Final Project Report**

Office of Naval Research

# **Deep Water Formation and Circulation in the Arctic Ocean Studied by Natural and Anthropogenic Tracers**

Award Number N00014-94-1-0507

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Principal Investigator

3/31/94 – 9/30/96

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### ***1. Background***

We requested funds for completion of measurements of tracer samples (tritium, helium isotopes, oxygen isotopes,  $^{14}\text{C}$ ) from the ARCTIC 91 expedition, as well as for the interpretation of these data. Additionally, funds were requested for participation in an icebreaker expedition to the Arctic Ocean originally planned for 1995. This cruise could not be organized. Therefore, the funds were used for sample collection in the framework of the 1994 joint U.S./Canada Arctic Ocean section (AOS 94).

### ***2. Sample Collection***

We collected the proposed number of samples along the AOS 94 section (for geographical position of the stations, see Fig. 1). We obtained good spatial resolution for most of the Canadian Basin. Due to technical problems with the Polar Sea, the sampling resolution in the Makarov Basin is lower than planned.

### ***3. Measurements***

The measurements of the samples from the ARCTIC 91 expedition were completed as planned. The data were combined with existing tracer data sets from the Arctic Ocean. The tritium and helium isotope data were measured at the L-DEO Noble Gas Laboratory (NGL). The  $^{18}\text{O}$  samples were measured in the stable isotope laboratory of Rick Fairbanks at L-DEO. We obtained a high-quality data set. Finally, the  $^{14}\text{C}$  samples were measured at the WHOI AMS facility at a precision of about  $\pm 3$  to 5‰.

#### 4. Results

The main results of the ARCTIC 91 data set were summarized in the Ph.D. theses of Drs. Dorothea Bauch (Bauch, 1994) and Brenda Ekwurzel (Ekwurzel, 1998). They are related to the following issues:

1. Determination of the fractions and water column inventory of the individual freshwater sources contributing to the Arctic surface waters (river runoff, sea-ice meltwater, Pacific inflow). The results were published in Bauch et al. (1995)
2. Determination of the mean residence times of the surface waters and the Atlantic waters in the Arctic Ocean (Schlosser et al., 1995a,b; Ekwurzel, 1998).
3. Derivation of the mean residence times of Canadian Basin Deep Water (Schlosser et al., 1994, 1997).

Whereas most of the results have been published, the tritium/<sup>3</sup>He sections will be published in the near future, together with other results summarized in Brenda Ekwurzel's thesis. These results are presently being prepared for publication. We are in the process of finishing three manuscripts for submission to JGR and DSR.

#### References

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### ***Figure Caption***

Figure 1: Geographical positions of the AOS 94 tracer stations.

